

REMARKS

In accordance with the foregoing, the specification is amended to correct a minor error. Claims 1, 4, 10, 14 and 15 are amended, claim 16 is cancelled without prejudice or disclaimer. Therefore, claims 1 – 14 and 15 are pending and under consideration. No new matter is presented in this Amendment.

REJECTIONS UNDER 35 U.S.C. §112:**Rejection of Claim 4 under 35 U.S.C. §112, second paragraph**

At page 3 of the Office Action, Claim 4 was rejected under 35 U.S.C. §112, second paragraph, as allegedly being indefinite. In particular, the Examiner alleged that it is unclear what is meant by “Bet”, “Im,” and “Me” recited in the claim. For the following reasons, this rejection is respectfully traversed and reconsideration is requested.

The terms “Bet,” “Im,” and “Me” are well-known in the art as abbreviations for bis(perfluoroethylsulfonyl)imide ($N(C_2F_5SO_2)_2$), bis(trifluoromethylsulfonyl)imide ($N(CF_3SO_2)_2$), Im), tris(trifluoromethylsulfonyl)methide ($C(CF_3SO_2)_3$, Me). However, to assist the Examiner, and since these compounds are already identified in claim 4 by their chemical name and formula, claim 4 is amended to delete the abbreviations. Claim 4 is also amended to correct an error in the chemical formula of the methide compound. Withdrawal of the rejection is therefore respectfully requested.

REJECTIONS UNDER 35 U.S.C. §102:**Rejection of Claims 1 - 2, 5, 7 - 9, 14 - 15 under 35 U.S.C. §102(b) over Koshina et al.**

At page 2 of the Office Action, claims 1 - 2, 5, 7 - 9, 14 - 15 were rejected under 35 U.S.C. §102(b) as being anticipated by Koshina et al. (JP 2-281572, abstract). The Examiner alleged that Koshina et al. teaches a battery comprising an electrolyte containing lithium phosphate hexafluoride and alkyl ammonium salt as a support electrolyte. The Examiner further alleges that the density of LiPF₆ is 0.75 to 1.5 mol/l and that the alkyl ammonium salt is 1.0 to 2.0 mol/l. The Examiner further states that “[a]s seen in the patent on page 453, lithium phosphate hexafluoride is LiPF₆.” For the following reasons, this rejection is respectfully traversed and reconsideration is requested.

As an initial consideration, since the Examiner has referred to the underlying patent document JP 2-281572 in setting forth grounds of the rejection, Applicants respectfully request that the Examiner supply the applicants with an English translation of the underlying document.

Independent claim 1, as amended, recites an electrolyte for use in a lithium-sulfur secondary battery, comprising an alkyl ammonium salt having a cation of the indicated Formula 1, a lithium salt, and an organic solvent. The Koshina et al. abstract, on the other hand, describes an electrolyte for a lithium secondary battery, but does not specifically teach or suggest an electrolyte for a lithium-sulfur battery. It is respectfully submitted that a person skilled in the art would recognize that an electrolyte for a lithium-sulfur battery is not interchangeable with an electrolyte for other types of lithium secondary batteries, such as a lithium ion battery. In particular, a person skilled in the art would recognize that an electrolyte for a lithium-sulfur battery requires a stable electrochemical reaction with polysulfides and must be able to dissolve highly concentrated polysulfides (see, for example, paragraph [0008] of the present specification). Thus, persons skilled in the art would recognize that the preamble recitation "for use in a lithium-sulfur battery" defines a physical limitation for the electrolyte and that this limitation is not met by a description of an electrolyte for a non-specific lithium secondary battery. Accordingly, the Koshina et al. abstract does not teach or suggest all of the limitations of claims 1 - 2, 5, 7 - 9, 14 - 15. Therefore, the rejection should be withdrawn.

Moreover, independent claim 15 is amended to include the limitations of claim 16, which the Examiner has found to be allowable. Therefore, claim 15 is allowable for this additional reason.

Rejection of Claims 1 - 3, 5 - 9, 11 - 15 under 35 U.S.C. §102(b) over Brand et al. (U.S. Patent 4,753,859).

Also at page 2 of the Office Action, claims 1 - 3, 5 - 9, 11 - 15 are rejected under 35 U.S.C. §102(b) as being anticipated by Brand et al. (U.S. Patent 4,753,859). The Examiner alleged that Brand et al. teaches that the electrolyte can be a mixture of lithium salt and tetraalkylammonium salts. The Examiner further alleged that the lithium salts have a concentration of 0.4-0.8 molar and that the tetraalkylammonium salts have a concentration of 0.2-0.4 molar. The Examiner further alleged that the solvent can be PC, ED METHF, DEC, trig and tetrag and that an electrolyte can comprise 35PC/35EC/30Trig and 0.8 M LiAsF₆. For the following reasons, this rejection is respectfully traversed and reconsideration is requested.

As discussed above, amended independent claim 1 recites an electrolyte for use in a lithium-sulfur secondary battery, comprising an alkyl ammonium salt having a cation the indicated Formula 1, a lithium salt, and an organic solvent. Brand et al., on the other hand, does not specifically teach or suggest an electrolyte for a lithium-sulfur battery. As discussed above, a person skilled in the art would recognize that an electrolyte for a lithium-sulfur battery is not interchangeable with an electrolyte for other types of lithium secondary batteries such as a

lithium ion battery and would recognize that the preamble recitation "for use in a lithium-sulfur battery" defines a physical limitation for the electrolyte. Since Brand et al. does not teach or suggest a lithium-sulfur battery, Brand et al. does not teach or suggest all of the limitations of claims 1 - 3, 5 - 9, 11 - 15. Therefore, the rejection should be withdrawn.

ALLOWABLE SUBJECT MATTER:

At page 3 of the Office Action, claims 10 and 16 were objected to as being dependent upon a rejected base claim. Applicants appreciate the Examiner's statement that these claims would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Accordingly, claim 10 is rewritten as an independent claim including the limitations of claim 1. Further, claim 14 is amended to depend from claim 10. Independent claim 15 is amended to include the limitations of claim 16, and claim 16 is canceled. Therefore, claims 10, 14 and 16 are clearly allowable. Moreover, Applicants note that claim 4 was not rejected over art and since the rejection under 35 U.S.C. §112, second paragraph, is overcome, as discussed above, this claim is also clearly allowable.

CONCLUSION:

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.


Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 503333.

Respectfully submitted,

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